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DEVELOPMENT OF INTERNATIONAL CLUSTERS IN THE BALTIC SEA REGION

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This article offers a comprehensive definition of international, cross-border, and transnational clusters. The author presents a classification of international clusters of the Baltic Sea states, and identifies cross-border and transnational clusters. The paper considers the features of international clusters in the Baltic Sea region, as well as certain cases of implementation of national and international cluster policy. A comparative analysis of the Baltic Sea region provides a basis for identifying countries with high concentration of international clusters such as the Scandinavian countries and Germany. Also, the analysis indicates the potential participants of international clusters, namely the Baltics and Poland as they are involved in a large number of international cluster initiatives. The author identifies the factors contributing to the formation of international clusters in the Baltic Sea region.

Key words: international cluster, cross-border cluster, transnational cluster, Baltic Sea region

The formation of clusters at an international level is an efficient mechanism for the innovative development of periphery regions of countries involved in cluster interaction. However, research works devoted to this phenomenon are of predominantly empirical nature and are aimed at describing certain cases without carrying out any comparative assessment. This article seeks to analyse the positive experience of the Baltic Sea region states in the field of international cluster interactions in order to identify the factors contributing to the formation of international clusters. The following objectives are fulfilled in this connection:

- 1) refinement of the conceptual framework;
- 2) identification of the features of international clusters in the Baltic Sea region states and an analysis of individual cases;

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3) identification of factors affecting the process of formation and development of international clusters in the Baltic Sea region states.

On the basis of definitions of *an international cluster* given by Russian [19; 21; 22; 27—31] and foreign researchers [3; 8; 11—13], in this paper, it is defined as stable interaction of a broad spectrum of interrelated, interdependent, and mutually complementary stakeholders localised on a territory of two or more countries. They operate in related fields, exhibit a similar level of skill and technology development, and are involved in joint manufacturing of goods and/or services, which produces a synergy effect in the development of territories and ensures innovation diffusion between them.

As to the level of localisation, all international clusters can be divided into two groups — transboundary and transnational ones. The *transnational* cluster is an international cluster, whose participants are concentrated as a rule in non-bordering regions of two or more countries; this cluster can be comprised of both a wide range of independent stakeholders and individual regional clusters. The *transboundary* cluster is also an international cluster; however, its members are localised in the border regions of neighbouring countries [25]. This classification helped identify successful cases of international cluster development in the Baltic Sea region (table 1).

Table 1

International clusters in the Baltic Sea region

International terms	Cluster localisation level	Examples in the Baltic Sea region
<i>Transboundary clusters</i>		
Cross-border cluster, trans-border cluster, bi-national cluster, transnational cluster	Bordering territories of neighbouring countries	<p>The Öresund region clusters — Denmark and Sweden: an ICT cluster, a biomedicine and pharmaceuticals cluster, a nanotechnology cluster, a food cluster, an environmental cluster, an animation and video cluster, a transport and logistics cluster, and a transport innovative network cluster.</p> <p>The Bothnian Arc clusters — Sweden and Finland: a research and education cluster, a metallurgy cluster, an ICT cluster, a woodwork and forestry cluster, and a recreational cluster.</p> <p>The clusters of Norwegian (the city of Oslo) and Swedish (Västra Götaland County) transboundary territories: a medical technology and ecotechnology clusters.</p> <p>The Jutland route clusters — Denmark and Germany: an alternative energy source cluster, a tourist cluster, a food cluster, a medical technology cluster, a transport and logistics cluster, and a research and education cluster.</p>

End of table 1

International terms	Cluster localisation level	Examples in the Baltic Sea region
<i>Transnational cluster</i>		
Bi-national cluster, tri-national cluster, transnational cluster	Territories of two or more — possibly adjacent — countries	<p>Service Cluster Denmark: Denmark, Sweden, Finland, The UK.</p> <p>Baltic Biomaterial Cluster: Germany, Poland, Lithuania, and Norway.</p> <p>Baltic Diabetes Cluster: Germany, Poland, Lithuania, and Norway.</p> <p>MediaEvolution: Sweden, Denmark, Austria.</p> <p>Oslo Cancer Cluster: Norway (Oslo), France (Toulouse), Denmark (Copenhagen), Sweden (Lund and Solna), Germany (Heidelberg) and the USA (North Carolina).</p> <p>AluCluster: Denmark, Sweden, Norway.</p> <p>ROBIN ROBotics — INnovations in Healthcare: Denmark (Odense), Germany (Schleswig-Holstein, Kiel).</p>

Source: compiled on the basis of [4; 6; 7; 15; 16; 18].

Most transboundary and transnational clusters are found in the Scandinavian countries. They participate in governmental initiatives aimed at the formation of regional growth centres, for example, the Danish-Swedish “Øresund Science Region” and the Swedish-Finnish “Bothnian Arc” clusters.

A high concentration of stable international clusters is found in the border areas of Sweden. The considerable scientific and technological, as well as innovative, potential of the country ensures the rapid development of such hi-tech areas as pharmaceuticals, ICT, biomedical technology, ecotechnology, nanotechnology, video and animation, etc. One of the key driving forces of cluster development within the triple helix model is the Swedish universities of Gothenburg, Lund, Malmö, Karlstad, Stockholm, Uppsala, etc.

The concentration of international clusters in Denmark is also rather high. The country’s indices of innovative, research, and technology development are comparable to those of Sweden; however, the synergy effect is produced through the difference in the areas of specialisation. A typical example is the Medicon Valley transboundary cluster, which brings together Danish companies specialising in pharmaceuticals and medical equipment, and Swedish companies carrying out R&D in the field of medicine and biotechnology [1]. Denmark also participates in other European international clusters, including those beyond the Baltic Sea region.

The key role in the formation of Danish innovative system is played by the Ministry of Science, Technology, and Innovation (MSTI). It addresses the issues of development in the field of research and technology at national and international levels, formulates public policy, supports competition in all branches of economy, manages the system of research funding, administers research clusters, etc.

Finnish international clusters are located predominantly in the area of the Bothnian Arc (Swedish and Finnish border regions). The major fields of their specialisation are ICT, metallurgy, woodworking and forestry, medicine, education, and R&D. The key objective of the government initiative

aimed at forming transboundary clusters is the development of the periphery border territories of both countries with a prospect of their further positioning as a mediator in the EU-Russia relations.

All in all, the basis for Finland's innovative policy is the state-supported Centre of Expertise Programme aimed at developing the specialisation of certain regions and the organisation of a management system. This programme gave a boost to the creation of a number of research companies seeking to accumulate new knowledge and carry out R&D in the framework of the identified priority areas.

Norway takes part in several international cluster formations. The country pays special attention to the development of the innovative component of the economy. Among the organisations working in this field, one can mention the Research Council of Norway, Innovation Norway, and the industrial development corporation of Norway — SIVA. A programme for the creation of a network of centres for research-based innovation (CRI) has been implemented since 2006 with the purpose of increasing the efficiency of innovation commercialisation. Another national programme is aimed at creating Norwegian centres of expertise (NCE). A number of seed funds — both private and state-financed — have been established in the country [26].

German companies take part in international cluster interactions both in the Baltic Sea region and beyond it. The federal government pursues a coherent policy of stimulating cluster development in order to accelerate the process of developing new technologies and further market penetration. Many German research infrastructures are world leaders in the fields of physics, geology, climate studies, and humanities. Being rather independent, federal states develop individual development programmes, finance R&D, and establish research organisations [20].

The most vivid examples of international clusters in the Baltic Sea region are listed in table 2.

The fact that most stable international clusters of the Baltic Sea region are concentrated in the Scandinavian countries and Germany is explained by the countries' favourable conditions for the formation of innovative clusters (a high level of economic development,¹ and great innovative, scientific and technological potential), as well as a coherent cluster policy and programmes for state support for clusters in the priority areas.

In the Nordic countries and Germany, considerable attention is paid to stimulating research, technological, and innovative activities. The innovative policy of these countries is aimed at increasing the efficiency of applying advanced knowledge and technologies accompanied by further innovation commercialisation, which is ensured by close interconnection between theoretical and practical studies.

¹ The Nordic countries and Germany are undisputed leaders in terms of competitive economies. They are at the third — highest — stage of development and are in the world's top ten in terms of innovation generation and promotion. The Baltics and Russia, according to the World Economic Forum's calculations, lag behind the leading countries in the values of global competitiveness index and are found between the second and third stages of economic development. In this respect, Russia ranks last among the Baltic Sea region states remaining 33% behind the leader — Sweden.

Table 2

Examples of international clusters in the Baltic Sea region [9; 10; 14]

Country / region	Cluster type and specialisation	Name	Cluster members
Sweden (Luleå) — Finland (Oulu)	Research and education trans-boundary cluster	Bothnian Arc of Knowledge	<i>Research:</i> 7 universities of Sweden and Finland (Luleå University of Technology (Sweden), the University of Oulu and the Rovaniemi University of Lapland (Finland)), Kemi-Tornio University of Applied Sciences, Oulu University of Applied Sciences, Rovaniemi University of Applied Sciences, Ylivieska Central Ostrobothnia University of Applied Sciences), as well as Swedish schools (Piteå musical school and Skellefteå woodwork technology school). <i>Authorities:</i> Finnish municipalities (Kemi-Tornio, Ii, Oulu, Raahе, Kalajoki); Swedish municipalities (Haparanda, Kalix, Boden, Luleå, Piteå). <i>Business:</i> hi-tech companies (Nokia, Elektrobit and Polar).
Sweden — Denmark (Øresund-region)	Pharmaceutics and biomedical technology transboundary cluster	Medicon Valley	<i>Research:</i> 12 university and 11 university clinics. <i>Authorities:</i> VINNOVA — the Swedish Governmental Agency for Innovation Systems, the Swedish Agency for Economic and Regional Growth — Tillväxtverket, the Öresund Committee. <i>Business:</i> 471 firms (350 natural science companies employing more than 250 people: Novo Nordisk, Lundbeck, LeoPharma, Nycomed, Ferring, AstraZeneca, Pfizer, ALK Abelló or Coloplast; 119 biotech companies; 24 pharmaceutical companies; 183 medical technology companies (the Swedish companies specialising in medical technology, the Danish ones specialising in pharmaceuticals and medical tools); 21 hospitals (more than 300 biologists, medical and service employees)).
Norway, France, Denmark, Sweden, Germany, and the USA	Transnational cancer research cluster	Oslo Cancer Cluster	As of 2008, the cluster brought together 56 organisations from Norway and North Europe: 26 biotech companies, 13 pharmaceutical companies, 9 research institutions and hospitals, 2 technology transfer offices, mediators, incubators, patient organisations, etc. As of 2012, the cluster brings together 71 members. The number of organisations from other countries interacting within the cluster is not mentioned in the annual reports of the organisation.

The above-mentioned countries pursue a coherent cluster policy¹; they have also drawn up programmes for state support for cluster development (table 3).

Table 3

Example of national programmes for state-supported cluster formation and development in the Baltic Sea region countries

Countries	Examples of national programmes
The Nordic countries and Germany	<p><i>Denmark</i>: Innovation Networks Denmark.</p> <p><i>Finland</i>: Centre of Expertise Programme; Strategic Centers for Science, Technology and Innovation.</p> <p><i>Germany</i>: Competence Networks Germany; Go-cluster; Central Innovation Programme for SMEs — Funding Module Network Projects (ZIM-NEMO); Cluster Policy Strategy of the Free and Hanseatic City of Hamburg.</p> <p><i>Norway</i>: Norwegian Centers of Expertise (NCE); the Arena Programme.</p> <p><i>Sweden</i>: Regional Growth through Dynamic Innovation Systems — VINNVÄXT.</p>
The Baltics and Poland	<p><i>Estonia</i>: Cluster Development Programme.</p> <p><i>Latvia</i>: Cluster Programme.</p> <p><i>Lithuania</i>: InnoCluster LT; InnoCluster LT+.</p> <p><i>Poland</i>: Polish Cluster Support.</p>

Source: compiled on the basis of [5].

The Scandinavian countries and Germany have drawn up a significant number of national programmes to provide support for cluster development with a strong emphasis on the innovative component. The priority area of such programmes is assistance to the development of network structure of small and medium innovative businesses exhibiting a high level of specialisation and localisation in a certain region.

Public support for R&D was a decisive factor in the cluster development of the Nordic countries: the development of a legal framework and its further improvement; the formation of an innovative system, the organisation of venture investment in R&D, the establishment of connections among business and research sectors, investment companies, and social and public organisations, as well as provision of support to small enterprises.

An example of a significant public contribution to the implementation of cluster policy is Finland, where cluster development issues are tackled by a

¹ According to the Russian Cluster Observatory's glossary, a cluster policy is a set of "joint, targeted, and documented actions taken by the representatives of business, authorities, educational and research institutions, as well as other cluster elements, aimed at the formation of favourable business environment conditions and an increase in the efficiency of all their elements" — see URL: <http://cluster.hse.ru/about> (accessed on 04.01.2013).

wide range of authorities, such as the Ministry of Industry and Trade, Ministry of Education, Ministry of Internal Affairs, Parliament, Cabinet of Ministers, Science and Technology Policy Council — STPC; Academy of Finland; National Technology Agency — TEKES; National Research and Development Centre for Welfare and Health — STAKES; Agricultural Research Centre of Finland; Technical Research Centre of Finland — VTT, and Finnish Innovation Fund — SITRA. The activities of these organisations are aimed at the formation and development of a modern innovative system in Finland, R&D funding, and the implementation of international projects.

An effective mechanism contributing to the formation of international clusters in the Nordic countries and Germany is presented by the initiatives of transnational corporations (TNC), which establish connections — both exogenous in relation to the cluster and endogenous in relation to the TNC — through their subsidiaries. Being a connective link between the competences of corresponding regional clusters forming the value-added chain, TNCs are the major providers of foreign direct investment [23] and play the role of a catalyser of the cluster initiative². As of the end of 2011, out of 100 leading TNCs, 12 were registered in Germany, 3 in Sweden, 1 in Norway, Finland, and Denmark. These companies specialise in the automotive industry (4 TNCs), electricity, gas and water supply (4 TNCs), telecommunications (3 TNCs), and pharmaceuticals and the chemical industry (3 TNCs) [17].

The results of implementing the cluster concept in the Baltics and Poland are less impressive. Today, most international associations are nothing else than cluster initiatives. However, these countries have considerable potential for creating and developing international clusters. For example, in Poland, by March 2012, approximately 212 cluster initiatives were registered in 16 voivodeships according to cluster catalogues, most of them in the Masovian (26), Warmian-Masurian (18), and Silesian (17) voivodeships. At the same time, most regional clusters gravitate towards integrating into international associations for further development and competence exchange [24]. Except individual international cluster initiatives, a programme for cluster internalisation is being implemented in the Baltics. For example, the Ventspils High Technology Park launched a project for interregional cooperation between SME clusters in the North-East corridor (Baltic Supply), which brings together partners from all countries of the Baltic region in order to gain access to international markets [2]. So, the Baltics and Poland have all preconditions for active participation in international cluster interactions in the Baltic Sea region.

A study into the successful cases of cluster policy implementation in the Baltic Sea region at an international level identified the following set of factors, which contribute to the formation and sustainable development of international clusters:

² As an example of the role played by TNC in the formation of international clusters, one can mention the Medicon Valley, where five largest transnational companies — Novo Nordisk, Nycomed, H. Lundbeck, AstraZeneca, LEO Pharma и Novozimes — opened their production facilities.

- 1) a sufficient level of scientific, technological, and innovative development in the participating countries;
- 2) active public support for stimulating the creation of innovative clusters and their internalisation;
- 3) the implementation of cluster support programmes at national and supranational levels.

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